

and 25 inches on the Gallatin River watershed. Amounts in Yellowstone Park vary greatly on the different watersheds and as to exposure.

As might be expected, the water equivalent of the snow where deepest and well settled is greater than where the covering is light.—*R. Q. Grant, Section Director.*

#### MEAN LAKE LEVELS DURING DECEMBER, 1914.

By UNITED STATES LAKE SURVEY.

[Dated Detroit, Mich., Jan. 4, 1915.]

The following data are reported in the "Notice to Mariners" of the above date:

Data.	Lakes.			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Mean level during December, 1914:				
Above mean sea level at New York.....	Feet. 602.08	Feet. 579.62	Feet. 571.31	Feet. 244.83
Above or below—				
Mean stage of November, 1914.....	-0.37	-0.30	-0.13	-0.42
Mean stage of December, 1913.....	-0.62	-0.72	-0.33	-1.08
Average stage for December, last 10 years.....	-0.23	-0.61	-0.45	-0.77
Highest recorded December stage.....	-1.05	-2.30	-2.22	-2.78
Lowest recorded December stage.....	+0.88	+0.62	+0.45	+1.40
Probable change during January, 1915.....	-0.3	-0.2	0.0	+0.1

#### FLOODS IN NEW ENGLAND RIVERS.

By ALFRED J. HENRY, Professor of Meteorology.

[Dated, Weather Bureau, Washington, D. C., January —, 1915.]

Floods in New England are due almost wholly to the breaking up of ice and the melting of snow on the head-water streams. When this annual event occurs in conjunction with heavy and prolonged rains the ordinary spring freshet becomes a damaging flood. The occurrence of heavy rains over New England is more or less fortuitous; hence the number of destructive floods is not great.

Thanks to the industry of Mr. W. W. Neifert, official in charge of the Hartford, Conn., Weather Bureau station, it is possible to present here a table of flood crests at Hartford extending back to the middle of the nineteenth century; also a statement of the maximum stages in the Connecticut at Springfield and Holyoke, Mass., extending back to 1870. The records of the earlier years, 1850–1870, are from the annual reports of the Chief of Engineers, etc., and the second source of information is the records of the Essex Company of Lawrence, Mass., as published in House Document No. 9, Sixty-second Congress, first session.

Only floods of considerable magnitude are included in this table. The present flood stage in the Connecticut at Hartford is taken as 16 feet above the zero of the local gage, and the highest stage ever recorded is 19.8 feet. It is therefore assumed that a 20-foot stage at Hartford corresponds to a serious flood there. A 20-foot stage in the Merrimac at Lawrence, Mass., causes inconvenience but no serious damage if the mills are warned of the approaching flood. These stages have been the criteria for selecting the floods listed in Table 1. If the gage height at either station was 20 feet or more it is considered and entered as a flood and the corresponding gage heights at the other stations are given, although they may not have been as much as 20 feet. This explains the appearance of stages less than 20 feet in the table at both Lawrence and Hartford. The times of the maximum stages at Holyoke and Springfield generally

harmonize with those for Hartford. When this is not the case it is manifest that the flood recorded at the lower station was not general in the middle and upper reaches of the river.

TABLE 1.—Chronological list of floods in New England, 1850–1913.

Year.	Merrimac River.		Connecticut River.					
	Lawrence, Mass.		Hartford, Conn.		Springfield, Mass.		Holyoke, Mass.	
	Stage.	Date.	Stage.	Date.	Stage.	Date.	Stage.	Date.
	Feet.		Feet.		Feet.		Feet.	
1850.....	22.7	May 1	20.0	May —			9.6	
1852.....	28.9	Apr. 23	23.2	Apr. 24				
1853.....			20.5	Nov. —				
1854.....	22.3	May 2	29.8	May 1	22.2			
1856.....	15.1	Aug. 23	23.3	Aug. 22				
1857.....	21.5	Apr. 16	19.5	Feb. 21				
1857.....	17.6	Oct. 28	18.2	Oct. 28				
1859.....	24.1	Mar. 21	26.4	Mar. 19				
1861.....	20.2	Apr. 16	21.5	Apr. 17				
1862.....	24.2	Apr. 21	28.7	Apr. 21	22.0	Apr. —		
1863.....	21.1	Apr. 20	22.2	Apr. 20				
1864.....	23.0	Mar. 8	17.2	Apr. 20				
1865.....	23.0	Mar. 18	24.8	Mar. 20				
1866.....	15.6	Feb. 15	20.5	Feb. 26				
1867.....	18.7	Apr. 19	17.2	Feb. 17				
1868.....	16.4	Mar. 20	21.5	Mar. 19				
1868.....	20.2	May 25	20.0	May 23				
1869.....	21.4	Apr. 23	28.7	Apr. 23				
1869.....	24.5	Oct. 6	26.3	Oct. 6	20.5	Oct. —		
1870.....	21.7	Jan. 4	19.2	Jan. 4				
1870.....	20.0	Feb. 21	21.3	Feb. 20				
1870.....	27.8	Apr. 21	25.3	Apr. 21				
1871.....	16.9	Mar. 14	16.5	Mar. 13				
1871.....	16.6	May 8	18.7	May 7	13.0	May 6		
1872.....	19.3	Apr. 12	21.0	Apr. 13	14.2	Apr. 12		
1873.....	18.8	do	21.2	do	15.0	do		
1874.....	20.8	Jan. 10	23.9	Jan. 9	17.5	Jan. 9	8.0	Jan. 9
1875.....	21.0	Apr. 6	18.4	Apr. 8	15.0	Apr. 5	6.0	Apr. 5
1876.....	20.6	Mar. 20	22.0	Apr. 16	17.0	Apr. 16	9.2	Apr. 16
1877.....	23.4	Mar. 29	22.9	Mar. 29	16.5	Mar. 29	8.8	Mar. 29
1878.....	21.0	May 1	18.5	Apr. 30				
1878.....	25.2	Dec. 12	24.5	Dec. 13	18.5	Dec. 11	9.2	Dec. 11
1879.....	17.8	May 3	21.5	May 1	15.8	May 1	8.5	May 1
1880.....	14.8	Apr. 6	15.4	Apr. 7	10.8	Apr. 6	5.7	Mar. 7
1881.....	15.4	Mar. 12	16.5	Apr. 26	11.5	Apr. 26	7.3	Dec. 31
1882.....	17.2	Mar. 4	14.8	May 31	10.9	Mar. 3	8.1	Sept. 24
1883.....	16.6	Apr. 14	20.5	Pr. 15	14.6	Apr. 14	7.1	Apr. 15
1884.....	21.8	Mar. 29	21.6	Mar. 28	16.0	Mar. 28	7.2	Mar. 28
1884.....	20.1	Apr. 19						
1885.....	13.7	Apr. 6	18.0	Apr. 24	13.3	Apr. 24		
1885.....	13.8	Nov. 11	16.8	Nov. 8			6.9	Nov. 10
1886.....	21.7	Feb. 15	18.4	Jan. 7	16.0	Apr. 2	7.9	Apr. 2
1886.....			21.8	May 4				
1887.....	17.8	Jan. 31	22.5	Apr. 13	17.0	Apr. 13	8.2	Apr. 13
1888.....	19.5	May 1	19.4	Apr. 8	17.7	May 1	8.9	May 1
1888.....			21.8	May 4				
1889.....	14.4	Nov. 30	15.6	Nov. 30	11.3	Nov. 29	5.0	Nov. 29
1890.....	14.6	Apr. 17	15.2	May 9	11.7	Oct. 21	5.8	Sept. 18
1890.....	17.1	Oct. 21	16.0	Oct. 26				
1891.....	20.2	Mar. 25	17.5	Jan. 24	14.2	Apr. 17	6.7	Apr. 19
1892.....	15.5	May 24	18.3	June 16	13.7	June 16	6.5	June 15
1893.....	21.3	May 6	24.0	May 6	18.1	May 5	8.4	May 5
1894.....	14.8	Mar. 9	13.8	Apr. 25	10.4	Apr. 26	4.8	Apr. 25
1895.....	26.9	Apr. 16	25.7	Apr. 16	20.2	Apr. 17	9.6	Apr. 17
1896.....	29.7	Mar. 3	26.5	Mar. 3	20.2	Mar. 3	9.5	Mar. 2
1897.....	14.4	Apr. 10	17.0	Apr. 10	15.2	June 12	7.0	June 11
1897.....	20.4	July 16	20.8	July 16			7.4	Dec. 16
1897.....	18.8	Dec. 17						
1898.....	18.5	Mar. 15	30.0	Mar. 16	15.5	Mar. 15	7.1	Mar. 21
1899.....	19.3	Apr. 17	22.0	Apr. 27	16.1	Apr. 27	7.4	Apr. 26
1900.....	22.5	Feb. 15	23.4	Feb. 15	17.0	Feb. 14		
1900.....	18.7	Apr. 21	22.8	Apr. 22			10.2	Apr. 21
1901.....	26.4	Apr. 9	25.8	Apr. 10	19.07	Apr. 9	11.4	Apr. 8
1901.....	17.3	Apr. 26	22.7	Apr. 23				
1902.....	24.3	Mar. 4	25.5	Mar. 4	19.2	Mar. 4	10.8	Mar. 4
1902.....	17.7	Mar. 19	19.8	Mar. 18				
1903.....	20.5	Mar. 13						
1903.....	18.8	Mar. 25	23.4	Mar. 25	17.4	Mar. 25	10.6	Mar. 24
1904.....	21.5	Apr. 30	21.4	Apr. 30				
1904.....	17.7	Mar. 28	19.5	Mar. 28	15.3	Mar. 28	9.5	Mar. 27
1905.....	20.1	Mar. 30	24.0	Apr. 2	17.5	Mar. 31	10.6	Apr. 1
1906.....	18.3	Apr. 17	19.8	Apr. 17	15.1	Apr. 17	8.9	Apr. 17
1906.....	19.5	May 30	18.5	May 30				
1907.....	15.3	Apr. 1	16.0	Apr. 1				
1907.....	18.0	Nov. 8	20.3	Nov. 9	15.4	Nov. 8	9.0	Nov. 8
1908.....			18.2	Mar. 31	13.1	Mar. 30	7.6	Mar. 30
1908.....	14.8	Feb. 17	18.5	Feb. 18				
1909.....	19.3	Apr. 16	24.7	Apr. 17	18.5	Apr. 16	10.6	Apr. 16
1910.....	16.1	Mar. 3	20.0	Jan. 23	15.0	Jan. 23	7.5	Mar. 27
1910.....			18.6	Mar. 3				
1911.....			15.5	Apr. 17	11.9	Apr. 7	7.2	Apr. 16
1911.....			16.0	Oct. 20				
1912.....	16.4	Apr. 9	21.2	Apr. 10	16.1	Apr. 9	9.3	Apr. 9
1913.....	19.6	Mar. 28	26.3	Mar. 29	20.9	Mar. 29	12.0	Mar. 28